Statistical Inference Course Project Part 2

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14 Januar 2018

Overview

In this Peer-Graded-Assignment the central limit theorem (CLT) and the ToothGrowth data will be analyzed. For the first part we will rely in the simulation power of R to empirically derive the CLT. In the second part the ToothGrowth data in the R datasets package will be analyzed using techniques learned in class such as confidence intervals and/or hypothesis tests.

Part 2

In this second part we will do statistical inference on the ToothGrowth data set from R. First we will take a look at the data set.

```
data("ToothGrowth")
str(ToothGrowth)
```

```
## 'data.frame':    60 obs. of  3 variables:
##  $ len : num  4.2 11.5 7.3 5.8 6.4 10 11.2 11.2 5.2 7 ...
##  $ supp: Factor w/ 2 levels "OJ","VC": 2 2 2 2 2 2 2 2 2 2 ...
##  $ dose: num  0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 ...
```

We see that there is a total of 60 observations with 3 variables: len, supp, and dose. Variables len and dose are numerical variables while supp gibe us information about what supplement was use during the test being a factor variable with 2 levels. Using the summary function in R we can analyze the numeric variables and see their spread.

```
summary(ToothGrowth)
```

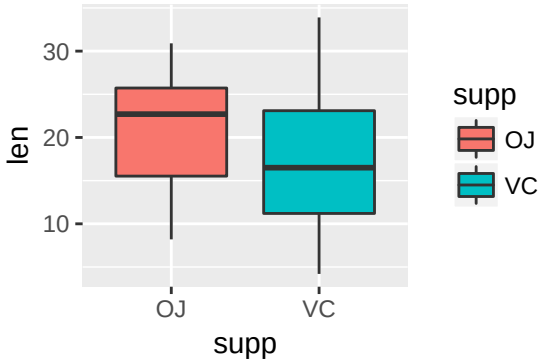
```
##       len        supp         dose
##  Min.   : 4.20   OJ:30   Min.   :0.500
##  1st Qu.:13.07   VC:30   1st Qu.:0.500
##  Median :19.25           Median :1.000
##  Mean   :18.81           Mean   :1.167
##  3rd Qu.:25.27           3rd Qu.:2.000
##  Max.   :33.90           Max.   :2.000
```

We can now see a boxplot for both dose to give us an better picture of the data. Furthermore we can see the effect that the dose has in the length.

```
aggregate(len ~ dose, ToothGrowth, mean)
```

```
##   dose    len
## 1  0.5 10.605
## 2  1.0 19.735
## 3  2.0 26.100
```

```
g <- ggplot(data = ToothGrowth, aes(x = supp, y = len, fill = supp))
g + geom_boxplot()
```



We see that the dose has a clear effect in the len. From the boxplot we can see that the supp changes the mean and the spread of the data. By using the t.test function in R we can compute the effect that both supplements have in the tooth growth.

```
t.output <- t.test(len ~ supp , data = ToothGrowth, paired = FALSE, var.equal = FALSE)
t.output$p.value
```

```
## [1] 0.06063451
```

With a p value of 0.06 we cannot reject the null hypothesis with a confidence of 95% that the different supplements have an effect in the tooth growth.

```
sub1 <- ToothGrowth[ToothGrowth$dose == 0.5 | ToothGrowth$dose == 1,]
sub2 <- ToothGrowth[ToothGrowth$dose == 1 | ToothGrowth$dose == 2,]

res1 <- t.test(len~dose, data = sub1, paired = FALSE, var.equal = FALSE)
res2 <- t.test(len~dose, data = sub2, paired = FALSE, var.equal = FALSE)
```

By looking at the pvalues: 0.0000001 and 0.0000191, we can reject the null hypothesis that the dose does not have an effect in the length of the tooth growth with a 95% confidence.

Conclussion

We can conclude that different doses lead to an increase in tooth growth, but we cannot say that different supplements lead to a difference in tooth growth.